

Phase I Advanced Battery Materials For Rechargeable Advanced Space-Rated Li-Ion Batteries, Phase I

Completed Technology Project (2009 - 2009)



Project Introduction

Lithium-ion (Li-ion) batteries are attractive candidates for use as power sources in aerospace applications because they have high specific energy (up to 200 Wh/kg), energy density (~ 500 Wh/L) and long cycle life (1,000-30,000 cycles depending on the depth of cycling). Yardney/Lithion, Inc. the leader in cutting edge Li-ion batteries is dedicated in research, development, design and manufacturer of high performing battery systems for aerospace, land and sea applications. At the present moment, two of the Lithion batteries are operating on the surface of Mars with great success. Future robotic and human exploration missions require advanced human-rated energy rechargeable batteries level metrics should have specific energy of 300 Wh/kg at C/2 discharge rate and 0

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C, and energy density greater than 500 Wh/l, with a calendar life of 5 years. The cycle life of the cell is required at 100% Depth of Discharge (DOD) in the range of 250 cycles. Yardney proposes to develop environmentally benign new electrode components and cell chemistries based on high capacity of 300mAh/g layered Li_2MnO_3 derivative cathode, composite silicon based anode with a capacity of over 600 mAh/g and suitable electrolyte.

Anticipated Benefits

Potential NASA Commercial Applications: High capacity and high energy applications include power tools, electric vehicles and telecommunications. Automotive and industrial sectors, where the slim, small-sized battery will deliver large amounts of energy. For example, the battery's advantages in size, weight and safety highly suit it for a role as an alternative power source for hybrid electric vehicles. Potential Non-NASA Commercial Applications: The new composite anode and cathode based Li-ion batteries for NASA find various applications which include power for landers, rovers, and Extravehicular activities (EVA). Areas of emphasis include advanced component materials with the potential to achieve weight and volume performance improvements and safety advancements in human-rated systems.



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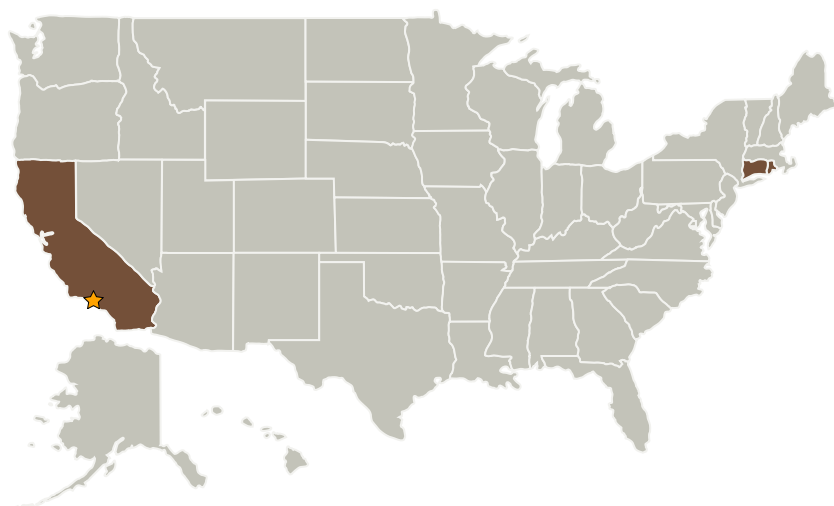
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Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★ Jet Propulsion Laboratory (JPL)	Lead Organization	NASA Center	Pasadena, California
Yardney Technical Products, Inc.	Supporting Organization	Industry	East Greenwich, Rhode Island

Primary U.S. Work Locations	
California	Connecticut
Rhode Island	

Project Transitions

 **January 2009:** Project Start **July 2009:** Closed out

Closeout Summary: Phase I Advanced Battery Materials For Rechargeable Advanced Space-Rated Li-Ion Batteries, Phase I Project Image

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Jet Propulsion Laboratory (JPL)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Project Manager:

Celestino Jun Rosca

Principal Investigator:

Joseph S Gnanaraj

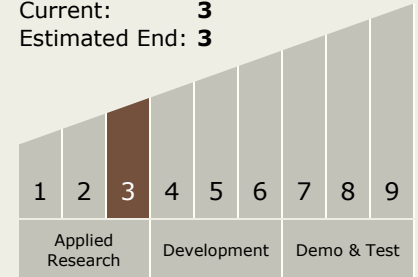
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Technology Maturity (TRL)

Start: **3**
Current: **3**
Estimated End: **3**



Technology Areas

Primary:

- TX03 Aerospace Power and Energy Storage
 - └ TX03.2 Energy Storage
 - └ TX03.2.1 Electrochemical: Batteries